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SPECIAL ARTICLE

SOCIAL AND ECONOMIC CONSEQUENCES OF OVERWEIGHT IN ADOLESCENCE AND YOUNG ADULTHOOD

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Abstract Background and Methods. Overweight in adolescents may have deleterious effects on their subsequent self-esteem, social and economic characteristics, and physical health. We studied the relation between overweight and subsequent educational attainment, marital status, household income, and self-esteem in a nationally representative sample of 10,039 randomly selected young people who were 16 to 24 years old in 1981. Follow-up data were obtained in 1988 for 65 to 79 percent of the original cohort, depending on the variable studied. The characteristics of the subjects who had been overweight in 1981 were compared with those for young people with asthma, musculoskeletal abnormalities, and other chronic health conditions. Overweight was defined as a body-mass index above the 95th percentile for age and sex.

Results. In 1981, 370 of the subjects were overweight. Seven years later, women who had been overweight had completed fewer years of school (0.3 year less; 95 percent confidence interval, 0.1 to 0.6; $P = 0.009$), were less likely

to be married (20 percent less likely; 95 percent confidence interval, 13 to 27 percent; $P < 0.001$), had lower household incomes (\$6,710 less per year; 95 percent confidence interval, \$3,942 to \$9,478; $P < 0.001$), and had higher rates of household poverty (10 percent higher; 95 percent confidence interval, 4 to 16 percent; $P < 0.001$) than the women who had not been overweight, independent of their base-line socioeconomic status and aptitude-test scores. Men who had been overweight were less likely to be married (11 percent less likely; 95 percent confidence interval, 3 to 18 percent; $P = 0.005$). In contrast, people with the other chronic conditions we studied did not differ in these ways from the nonoverweight subjects. We found no evidence of an effect of overweight on self-esteem.

Conclusions. Overweight during adolescence has important social and economic consequences, which are greater than those of many other chronic physical conditions. Discrimination against overweight persons may account for these results. (*N Engl J Med* 1993;329:1008-12.)

OVERWEIGHT is an increasingly prevalent nutritional disorder among children and adolescents in the United States.¹⁻³ Numerous health risks have been associated with adolescent overweight, including hypertension, respiratory disease, several orthopedic disorders, diabetes mellitus, and elevated serum lipid concentrations.⁴ These health risks persist for many years; in a recent study, overweight during adolescence was associated with increased long-term mortality among men and reduced functional status among elderly women.⁵

Overweight during adolescence also has social, economic, and psychological consequences, including effects on high-school performance,⁶ college acceptance,⁷ and psychosocial functioning.⁸ One study found a greater prevalence of overweight among women who were downwardly mobile socially than among those who were upwardly mobile.⁹ These studies are not recent, however, and were restricted to limited geographic areas.

The severity of chronic conditions like adolescent overweight is reflected not only by physiologic indicators, morbidity, and health care costs, but also by the effect of the condition on performance in school and at

work and psychological functioning.¹⁰ In this study, we prospectively examined the relation between overweight among 10,039 adolescents and young adults and their social and economic characteristics and self-esteem seven years later. We compared the results in this group with similar outcomes in a sample of young people with other chronic conditions and with the association of socioeconomic characteristics and another physiologic measure, height. The results indicate that overweight adolescents and young adults marry less often and have lower household incomes in early adult life than their nonoverweight counterparts, regardless of their socioeconomic origins and aptitude-test scores.

METHODS

The National Longitudinal Survey of Labor Market Experience, Youth Cohort (NLSY), consists of a national probability sample of young people interviewed first in 1979 and annually thereafter. At each interview, the respondents answered an extensive questionnaire administered by an interviewer. Complete data for the major variables of interest through 1988 were available for 8308 to 10,039 respondents (65 to 79 percent of the original cohort), depending on the variable. The rates of retention in the study differed by less than 2.5 percent among the major racial and ethnic groups¹¹ and were similar in both the overweight and nonoverweight groups.

Socioeconomic and Demographic Characteristics and Overweight

Survey respondents provided detailed information about their family background, parents' education, race and ethnic group, personal social and economic characteristics, education, and occupa-

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tion and a thorough job history at the initial interview in 1979. These data were then updated annually.

Household income was defined as the sum of the income and other earnings received by the respondent, his or her spouse, and other members of the family (if any) during the year. Earnings were computed by adding together all reported wages (including military pay), salary, commissions, and tips. Income was computed as the sum of earnings and any other income.¹² Poverty in a household was defined according to federal poverty guidelines. The relatively high rates of missing data on income and household poverty reflect missing information on components of income that prevented calculation of these variables.¹²

We defined overweight as a body-mass index (calculated as the weight in kilograms divided by the square of the height in meters) above the 95th percentile for age and sex, as defined in national standards derived from the First National Health and Nutrition Examination Survey (NHANES I) conducted in 1971 through 1973.¹³ The body-mass index was based on the height and weight reported by the subject in 1981. If a woman was pregnant, we subtracted any weight gained during pregnancy. The correlations between self-reported and measured values in other studies of adults ranged from 0.96 to 0.99.^{14,15} In a nationally representative study (NHANES II), self-reported and measured height and weight among subjects from 20 through 24 years of age differed appreciably for only 1 percent of men and 3 percent of women, leading to some underreporting of overweight.¹⁶ The body-mass index also correlates well with laboratory measures of body fat.¹⁷

Asthma, Musculoskeletal Abnormalities, and Other Chronic Physical Conditions

Six percent of the sample reported having a health condition in 1979 that caused limitations in the amount or kind of work they could perform. These conditions were coded according to the categories of the *International Classification of Diseases, 9th Revision* (ICD-9), and 242 different conditions were identified. A panel of five pediatricians experienced in the study of chronic illness reviewed the conditions to rate them as either acute or chronic and to exclude mental health conditions. We classified as chronic physical conditions all those of at least three months' duration that were agreed on by three or more of the members of this panel, resulting in a total of 55 diagnostic categories. These included asthma (73 cases), anomaly of the spine (10 cases), diabetes mellitus (8 cases), rheumatoid arthritis (8 cases), epilepsy (7 cases), cerebral palsy (5 cases), scoliosis (5 cases), congenital heart anomalies (4 cases), lower-limb anomalies (4 cases), profound impairment of vision (4 cases), muscular dystrophy (3 cases), congenital foot deformity (3 cases), and sickle cell anemia (2 cases). We excluded pregnancy or pregnancy-related conditions, acute fractures, sprains or dislocations, obesity, and mental health conditions.¹⁸

Other Variables

A 10-item Rosenberg self-esteem scale included in the 1980 and 1987 surveys measured the subjects' positive and negative attitudes toward themselves.¹⁹ We estimated the reliability (coefficient alpha²⁰) of the scale and found values above 0.84 for both men and women in 1980 and 1987, indicating good internal consistency and reproducibility.

Intelligence was measured by the Armed Forces Qualification Test (AFQT), derived from the Armed Forces Vocational Aptitude Battery administered to respondents to the NLSY in 1980.¹²

Statistical Analysis

The NLSY oversampled blacks, Hispanics, and poor non-Hispanic whites. We weighted survey data with sample weights provided by the NLSY to calculate means and proportions so that all descriptive statistics would reflect a sample representative of the United States population in this age group.

We used t-tests to compare mean results and chi-square tests to compare differences in proportional results. We calculated multiple linear regressions and then computed the adjusted differences and

95 percent confidence intervals from these regressions. We calculated both linear and logistic-regression coefficients in the case of dichotomous dependent variables.

We assumed a simple random sample when calculating statistics, despite some clustering of the sample that had occurred by design.¹¹ Design effects do not bias estimates of coefficients and odds ratios, but they do affect P values and confidence intervals. Therefore, we considered significant only differences or coefficients with significance levels of 0.01 or less. We included covariates that reflected the sampling design in the multivariate regressions. All P values are two-tailed. The sample sizes in the tables vary because of missing values.

RESULTS

Base-Line Prevalence of Overweight

In 1981 the prevalence of overweight in this sample was 3.0 percent among female subjects and 3.4 percent among male subjects. The prevalence of overweight was greater among black women than among non-Hispanic white women (5.8 percent vs. 2.5 percent, $P < 0.001$). Other associations of base-line characteristics with overweight are shown in Table 1. Among women, overweight was associated with lower household income in 1979, a lower AFQT score, and a lower paternal and maternal educational level. Among men, there were no associations between base-line socioeconomic variables and overweight.

Characteristics Seven Years Later

When we examined the social and economic variables and self-esteem in 1988, we found generally lower levels of socioeconomic attainment among the subjects who were overweight in 1981; the crude estimates of the difference were greater for women (Tables 2 and 3). Both women and men who had been overweight

Table 1. Base-Line Characteristics of Overweight and Nonoverweight Subjects 16 to 24 Years of Age in the United States in 1981, According to Sex.*

VARIABLE	WOMEN (N = 5138)		MEN (N = 4901)	
	OVERWEIGHT	NONOVERWEIGHT	OVERWEIGHT	NONOVERWEIGHT
No.	195	4943	175	4726
Race or ethnic group (%)				
White	65	80	77	80
Black	28	14	14	14
Hispanic	7	6	9	6
Mean age (yr)	18.3	17.7	17.7	17.6
Mean maternal education (yr)	10.5	11.5	11.3	11.7
Mean paternal education (yr)	10.0	11.7	11.0	12.0
Mean household income in 1979 (\$)	15,783	18,602	19,303	19,540
Chronic health condition in 1979 (%)	0.7	1.8	0.3	2.0
Mean weight in 1981 (kg)	90.5	57.8	102.8	72.4
Mean height in 1981 (m)	1.61	1.64	1.76	1.78
Mean AFQT score in 1980	62	71	68	70
Mean education in 1979 (yr)	10.6	10.7	10.2	10.5
Married in 1979 (%)	12	13	4	5
Mean self-esteem in 1980†	31.9	32.4	32.1	32.7

*All estimates are weighted.

†Measured on the Rosenberg scale.

Table 2. Estimated Effect of Overweight in Adolescence on Subsequent Social and Economic Characteristics and Self-Esteem among Women.*

VARIABLE	OBSERVED VALUE		CRUDE ESTIMATE OF DIFFERENCE (95% CI)		ADJUSTED ESTIMATE OF DIFFERENCE (95% CI)		P VALUE
	OVERWEIGHT (N = 195)	NONOVERWEIGHT (N = 4943)					
Married (%) (n = 4922)	28	56	-28	(-21 to -35)	-20	(-13 to -27)	<0.001
Household income (\$) (n = 4286)	18,372	30,586	-12,214	(-10,295 to -14,133)	-6,710	(-3,942 to -9,478)	<0.001
Income below poverty level (%)† (n = 4286)	32	13	19	(11 to 27)	10	(4 to 16)	<0.001
Education (yr) (n = 4881)	12.1	13.1	-1.1	(-0.8 to -1.4)	-0.3	(-0.1 to -0.6)	0.009
Completed college (%) (n = 4881)	9	21	-12	(-7 to -17)	-3	(-8 to 2)	0.21
Self-esteem in 1987 (n = 5138)	32.4	33.6	-1.1	(-0.6 to -1.7)	-0.4	(-0.8 to 0.1)	0.38

*Overweight was determined in 1981, social and economic characteristics in 1988, and self-esteem in 1987. Effects have been estimated from regression equations with control for base-line variables. Data are from the NLSY. The sample size varies slightly because of missing data. The following base-line variables were controlled for in multivariate regression analyses: household income in 1979, educational level in 1979, marital status in 1979, mother's educational level in 1979, father's educational level in 1979, AFQT score in 1980, the presence of a work-limiting chronic health condition in 1979 (excluding obesity), height in 1981, self-esteem in 1980 (measured on the Rosenberg scale), age in 1981, and race or ethnic group; separate indicators were included for missing data on income, father's educational level, and mother's educational level. CI denotes confidence interval.

†Household poverty was defined according to federal poverty guidelines.

were less likely to have married, had completed fewer years of education, and had lower household incomes, lower self-esteem, and higher rates of poverty than those who had not been overweight.

Multivariate Models

We next examined the relation between overweight in 1981 and measures of social and economic attainment in 1988, controlling for base-line characteristics, including household income, the respondent's educational level, the mother's and father's educational level, the score on the AFQT, the presence of a chronic physical health condition, height, self-esteem, age, and race or ethnic group. We also performed analyses predicting educational attainment in 1988 in which we did not control for education at base line, because a substantial number of subjects would have completed their education before this time. Similarly, we performed analyses predicting self-esteem in 1987 in which we did not control for self-esteem at base line.

The addition of these control variables yielded results that differed little from the unadjusted relations. Overweight adolescents and young adults married less often and had lower household incomes in their early adult life, independent of their socioeconomic origins and aptitude-test scores. Seven years later, women who had been overweight had completed fewer years of school (0.3 year less; 95 percent confidence interval, 0.1 to 0.6; $P = 0.009$), were less likely to have married (20 percent less likely; 95 percent confidence interval, 13 to 27 percent; $P < 0.001$), had lower household incomes (\$6,710 less per year; 95 percent confidence interval, \$3,942 to \$9,478; $P < 0.001$), and had higher rates of household poverty (10 percent higher; 95 percent confidence interval, 4 to 16 percent; $P < 0.001$) than other women, independent of base-line characteristics (Table 2). Overweight men were less likely to have married (11 percent less likely; 95 percent confidence interval, 3 to 18 percent; $P = 0.005$) (Table 3). We found no evidence for an effect of overweight on

self-esteem once we controlled for base-line variables. The results were similar to those shown in Tables 2 and 3 for the regression analyses in which we did not control for base-line educational level or self-esteem. The addition of interaction terms to the models to determine whether the relation of overweight to subsequent social and economic characteristics varied according to race or ethnic group did not alter the results.

As expected, 77 percent of the men and 66 percent of the women who were overweight in 1981 were still overweight in 1988. We compared the subjects who were overweight in both 1981 and 1988 with those who were overweight only in 1981 and found that the association with socioeconomic characteristics in 1988 was similar in the two groups. The results of the logistic-regression analyses were consistent with those of the linear regression analyses. Women who were overweight in 1988 were more likely to be unmarried (odds ratio, 2.5; 95 percent confidence interval, 1.8 to 3.5; $P < 0.001$) and poor (odds ratio, 2.0; 95 percent confidence interval, 1.1 to 2.4; $P = 0.01$) than other women, independent of base-line characteristics. Men who were overweight in 1988 were also more likely to be unmarried (odds ratio, 1.6; 95 percent confidence interval, 1.2 to 2.3; $P = 0.005$).

We also conducted analyses with overweight redefined as a body-mass index above the 85th percentile for age and sex.¹³ When this definition was used, 13 percent of the women and 14 percent of the men were overweight in 1981. The results of regression analyses were similar to those we obtained using the 95th percentile as the threshold for overweight, although the magnitude of the estimated effects was reduced. Overweight women were less likely to have married (6 percent less likely; 95 percent confidence interval, 2 to 10 percent; $P = 0.002$) and had lower household incomes (\$3,602 less per year; 95 percent confidence interval, \$2,068 to \$5,137; $P < 0.001$) than other women, independent of base-line characteristics. No statistically significant effects were found among the men.

Table 3. Estimated Effect of Overweight in Adolescence on Subsequent Social and Economic Characteristics and Self-Esteem among Men.*

VARIABLE	OBSERVED VALUE		CRUDE ESTIMATE OF DIFFERENCE (95% CI)	ADJUSTED ESTIMATE OF DIFFERENCE (95% CI)	P VALUE
	OVERWEIGHT (N = 175)	NONOVERWEIGHT (N = 4726)			
Married (%) (n = 4642)	40	48	-8 (-1 to -15)	-11 (-3 to -18)	0.005
Household income (\$) (n = 4022)	26,008	31,462	-5,454 (-2,488 to -8,420)	-2,876 (-10 to -5,742)	0.05
Income below poverty level (%)† (n = 4022)	17	10	7 (1 to 13)	5 (-1 to 9)	0.07
Education (yr) (n = 4610)	12.4	13.1	-0.8 (-0.5 to -1.1)	-0.2 (-0.5 to 0.0)	0.08
Completed college (%) (n = 4022)	10	23	-13 (-8 to -18)	-5 (0 to 10)	0.05
Self-esteem in 1987 (n = 4901)	32.8	33.9	-1.1 (-0.5 to -1.7)	-0.2 (-0.8 to 0.30)	0.17

*Overweight was determined in 1981, social and economic characteristics in 1988, and self-esteem in 1987. Effects have been estimated from regression equations with control for base-line variables. Data are from the NLSY. The sample size varies slightly because of missing data. The following base-line variables were controlled for in multivariate regression analyses: household income in 1979, educational level in 1979, marital status in 1979, mother's educational level in 1979, father's educational level in 1979, AFQT score in 1980, the presence of a work-limiting chronic health condition in 1979 (excluding obesity), height in 1981, self-esteem in 1980 (measured on the Rosenberg scale), age in 1981, and race or ethnic group; separate indicators were included for missing data on income, father's educational level, and mother's educational level. CI denotes confidence interval.

†Household poverty was defined according to federal poverty guidelines.

In contrast, we found no evidence of significant effects of other chronic physical conditions as a group on later socioeconomic characteristics, marital status, or self-esteem. The results were similar when asthma was excluded from the group of chronic conditions.

Height also predicted socioeconomic characteristics among men. Among women, this variable had little independent value in predicting subsequent characteristics after we controlled for base-line variables. Among men, however, a 30-cm (12 in.) reduction in height was independently associated with a 10 percent increase in the prevalence of poverty (95 percent confidence interval, 6 to 13 percent; $P < 0.001$) and a decrease of \$3,037 in household income (95 percent confidence interval, \$1,084 to \$4,990; $P = 0.002$).

DISCUSSION

This study indicates that overweight during adolescence and young adulthood has important social and economic consequences that are more severe for women than for men and greater than those associated with a variety of other chronic conditions during adolescence. A number of hypotheses could explain these results. One hypothesis is that differences in social and economic characteristics between overweight and nonoverweight young people can be explained by differences in socioeconomic origins or ability.²¹⁻²³ However, we still found that marriage was substantially less frequent and socioeconomic attainment less great among the subjects who were overweight in 1981 after we controlled for base-line differences in potentially confounding variables. A second hypothesis suggests that people who are overweight may have associated health problems that limit their socioeconomic attainment.²⁴ Our data, as well as those of others,²⁵ indicate, however, that persons with other chronic physical conditions do not have lower socioeconomic attainment or a lower likelihood of marrying, or at least that the largest effects are limited to those with severe impairments.¹⁸ To examine this possibility further, we

added a variable to the regression analyses indicating subjects who had a work-limiting chronic health condition in 1988. In these analyses the estimated effects of overweight on attainment did not change, indicating that health conditions existing in 1988 that arose from the subjects' overweight were not an explanation for their lower attainment. Alternatively, overweight persons may have impaired physical function that limits their job performance and their search for a marital partner. Our data base included no direct measures of physical function, and thus our study cannot address this possibility.

A final hypothesis centers on the potential role of stigma associated with obesity or overweight, and of subsequent discrimination. Overweight differs from many other chronic conditions in its visibility. Unlike other attributes such as skin color or sex, as Rothblum states, "weight is thought to be under voluntary control, so that fat people are held responsible for their condition and for changing it."²⁶ Furthermore, the perception that overweight people are physically less attractive²⁷ could lead to lower rates of marriage.

Evidence from several studies indicates that obese persons, particularly women, are highly stigmatized in the United States. There is evidence of discrimination against obese persons,^{28,29} including "employer prejudice,"²⁴ and lower-than-expected levels of occupational attainment among overweight workers.³⁰ Although we did not measure it directly, discrimination could explain our findings, because the regression models controlled for a wide variety of other known causes of lower socioeconomic attainment.

We also hypothesized that the stigma and discrimination associated with overweight would limit normal psychosocial development and promote low self-esteem, but we found no such effect. We had extremely limited data on psychological outcomes, however. Nonetheless, our results are consistent with the view of others that there is little relation between obesity and psychological disturbance.^{31,32}

The finding that overweight adolescents and young

adults subsequently have lower household incomes and higher rates of poverty than those who are not overweight may partly explain the inverse relation between socioeconomic attainment and obesity that has been reported previously. In industrialized countries, obesity is less frequent among wealthier women than among others, although this association does not hold among men.³³ Our data suggest that overweight may be an important determinant of socioeconomic status among women in the United States. This observation is contrary to the more prevalent assumption that socioeconomic status influences overweight, principally through behavioral factors that may mediate this relation, such as diet and exercise.³³ Our data indicate that at least part of this relation may be a socioeconomic consequence of overweight.

Stigma and discrimination could also explain the association among men between height and later household income and poverty. Tanner has noted the association of greater social mobility with taller stature in a number of societies,³⁴ and many studies indicate the association of short stature among men with psychological difficulties and lower perceived social status.³⁵

In summary, overweight during adolescence has important social and economic consequences that are greater than those associated with many other chronic physical health conditions. Discrimination against people who are overweight may account for these results. The recent Americans with Disabilities Act prohibits discrimination in employment and in establishments serving the public.³⁶ Our data suggest that the extension of this act to include overweight persons should be considered. Our findings also emphasize the need for effective prevention of this increasingly prevalent condition.

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